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AGREED METHODOLOGY FOR COMPUTING CAPABILITY OF INLAND WATERWAYS

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1. INTRODUCTION

There are many factors to consider in computing the capability of an inland waterway route. Capability, as used in this study, is defined as the practical maximum performance which a waterway facility or system can accomplish when the limitations of the major contributing factors are considered. Capability differs in its meaning from capacity, which in this study is taken to be the theoretical maximum performance that could be attained by a given facility, provided that all contributing factors - such as barges, tugs, terminal facilities, personnel, and weather - could be introduced into the system to an optimum degree. The main problem is capability, since normally there will be some known restrictions affecting performance. The same formulas may be used to compute capacity by assuming maximum values for all factors considered.

The problem is to arrive at a logical method of computing an inland waterway's capability for moving cargo from one point to another on a continuing basis. Goods are to be

loaded at the point of origin, moved along the waterway, and unloaded at the destination. To complete the cycle, the empty craft must be returned to the point of origin. Delivery of cargo to the loading point and removal from the unloading point are not considered, since these movements are more properly in the province of some other medium of transport. In the absence of a reliable means of determining manpower requirements and efficiency, it is assumed that an adequate number of qualified personnel is available.

Three basic factors affect the overall waterway capability; any one of these may be limiting. They are as follows: first, capability of the route itself; second, capability of terminal facilities; and third, capability of available barges or towing power. The restrictions imposed by these three limiting factors should be considered separately for each waterway or waterway route to determine which one will impose the most restricting influence. The route may be restricted by locks, shallow depths, bridge or other structural clearances, bottlenecks requiring

one-way traffic, or any other factor imposing a time limitation. Terminal facilities may be limited by a lack of usable berthing or working space. However, most factors in port operation are resolvable, since suitable surfaces can be provided for the working space, the necessary mechanical-handling equipment can be brought along on the barges, or otherwise provided, and portable generators can be easily rigged to insure around-the-clock operation. Craft capability may become the determining factor when there are insufficient craft to saturate the waterway. In the following paragraphs, methods for determining these three capabilities are discussed and working formulas developed.

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2. Methodology for Computing Water Route Capability

The capability of a water route, exclusive of craft and terminal capabilities, is defined as the maximum performance that can be accomplished when the limitations of both natural and artificial characteristics, such as channel widths and depths and restricting structures (locks, bridges, etc.), are considered. Route limitations may be divided into two categories, time limitations and size limitations. Single-point restrictions or bottlenecks, such as locks and rapids, place a time limitation on the flow of traffic. Limiting dimensions, such as depths and lock sizes, limit vessel size. After the maximum usable vessel size for the route has been determined, the capability of a waterway limited by locks or other single-point restrictions is determined by the restriction placing the greatest time limitation on the flow of traffic. While the smallest lock limits vessel size for the route, the greatest time limitation may be imposed by a larger lock or other restriction. The capability of a water route may

be considered as virtually unlimited when no single-point restriction is encountered. In such a case, the limiting factor insofar as through tonnage is concerned is found either in the terminal or fleet capability. However, when there is a single-point restriction , the following formula may be used to determine the capability of the water route itself.

$$\text{Formula: } X_1 = amb \qquad \text{(i)}$$

Where:

X_1 = capability of the water route in tons (each way) per day

a = rated cargo capacity or the largest lift unit (single barge or multiple tow) which can pass the most limiting lock (or other restriction) per passage.

m = % of rated cargo capacity available considering the type of cargo hauled.

b = number of passages each way per day through the most limiting lock.

Note: $b = \frac{60c}{t}$

Where:

c = number of operating hours per day

t = longest locking cycle in minutes

60 = factor to convert hours to minutes

3. Methodology for Computing Inland Waterway Terminal Capability

Since the capability of a Waterway is given between two points or river ports, the capabilities of the loading and discharging terminals must be estimated to determine the adequacy of each to handle the traffic the water route could transport. The following formula is used to determine the capability of any given terminal facility.

$$\text{Formula:} \quad X_2 = gh \qquad \text{(ii)}$$

Where:

X_2 = terminal capability in tons per day

g = length of usable berthing space in linear feet

h = cargo-handling rate in tons per linear foot of usable berthing space per day.

4. Fleet Capability

To assess fleet capability it is necessary to examine the capabilities of both cargo craft and towing craft which are suitable for operation on the waterway. The lower of the two capabilities is the capability of the fleet. The capability of cargo craft can be expressed directly in tons per day. The capability of towing craft can be expressed in terms of numbers of barges making up a barge tow, which can then be expressed in terms of tons per day using the same formula.

Self-propelled cargo craft have both a cargo-carrying and a towing capability. Their capability may be computed separately, or, when they represent a small percentage of total fleet inventory, they may be included with dumb craft in assessing fleet capability in tons per day. If self-propelled cargo craft are included in the towing-craft inventory, their towing capability must be computed separately, since they will have a longer turnaround time than tugs. The following formulas

are used to determine the capability of cargo craft and towing craft respectively.

a. Cargo Craft

Formula: $$X_3 = \frac{V_1}{T_1} \qquad \text{(iii)}$$

Where:

X_3 = cargo craft capability in tons per day

V_1 = total usable cargo craft tonnage

T_1 = cargo craft turnaround in days .

Note: $T_1 = \frac{2D}{Sc} + P_1 + L$

Where:

D = Length of haul in miles one way

S = Average speed of craft in miles per hour in open waterway

c = number of operating hours per day

2 = factor for two-way operation

P_1 = time spent in port in days by cargo craft

L = time spent in locks in days (including waiting time).

However: $P_1 = \frac{2U}{yf}$

Where:

U = average vessel load in tons (actual load, not rated capacity)

y = length of the working day in port in hours (may differ from length of operating day on waterway)

f = rate of handling cargo in tons per hour

2 = factor to account for double operation (loading and unloading).

Furthermore: $L = \frac{Nt}{60c}$

Where:

N = number of locks on the waterway

t = longest locking cycle in minutes

60 = factor to convert time to hours

c = number of operating hours per day.

Also: $V_1 = Qr_1m$

Where:

Q = total cargo-carrying capacity

r_1 = % of total cargo-carrying capacity available after deadlining loss

m = % of rated cargo capacity available considering type of cargo hauled. (Situations may arise when vessels cannot be loaded to capacity because of shallow depths. In these cases, the percentage of rated cargo capacity may be further reduced to allow for this factor.).

Therefore: $X_3 = \frac{Qr_1m}{\frac{2D}{Sc} + \frac{2U}{yf} + \frac{Nt}{60c}}$

b. Towing Craft

Formula: $$X_4 = \frac{ABUr_2}{T_2} \qquad \text{(iv)}$$

Where:

X_4 = towing-craft capability in tons per day

A = number of tugs available

B = number of cargo craft (barges) per tug

U = average vessel load in tons

r_2 = % of tugs available after deadlining loss

T_2 = tug turnaround time in days.

However: $$T_2 = \frac{2D}{Sc} + P_2 + L$$

Where:

P_2 = time spent in port by tugs in days.

Therefore: $$X_4 = \frac{ABUr_2}{\frac{2D}{Sc} + P_2 + L}$$

5. Methodology for Computing Cargo-Carrying Capacity Requirements

a. Cargo craft (barge) requirements

The cargo-carrying capacity requirements represent the aggregate tonnage of craft required to meet either the water route capability (X_1) or waterway terminal capability (X_2),

whichever is lower, and are determined by the following formulas.

Formula: $R_1 = \dfrac{(X_1 \text{ or } X_2)\ T_1}{r_1 m}$ (v)

Where:

R_1 = cargo craft requirements (in total ton-carrying capability) to haul a given tonnage per day

X_1 = capability of water route in tons (each way) per day (see formula (i)

X_2 = terminal capability in tons per day (see formula (ii)

T_1 = cargo craft turnaround time in days, or as indicated in formula (iii)

r_1 = % of total cargo-carrying capacity available after deadlining loss

m = % of rated cargo capacity available considering type of cargo hauled.

b. Towing craft (tug) requirements

Formula: $R_2 = \dfrac{CT_2}{BT_1 r_2}$ (vi)

Where:

R_2 = number of tugs required to handle a given number of cargo craft

C = number of cargo craft available after deadlining loss

B = number of cargo craft per tug

T_2 = tug turnaround time in days

T_1 = cargo craft turnaround time in days

r_2 = % of tugs available after deadlining loss.

APPENDICES

A. Suggested Values for Factors in Methodology

B. Methods of Determining Tonnage that can Pass the Most Limiting Lock

C. Glossary

APPENDIX "A"

Suggested Values for Factors in Methodology

This appendix is designed to assist the researcher in determining waterway capabilities when some of the factors are unknown. The values presented are offered solely as a guide and should not be arbitrarily used without some knowledge of the waterway facilities and practices in the area under consideration. Failure to apply sound judgment when utilizing these values may result in estimates far removed from either actual or potential performance.

1. Number of Operating Hours Per Day (c)

Although some waterways may be operated 24 hours per day, this is not a universal practice. Factors influencing the duration of operation include operating experience, peculiarities of the waterway, latitude at which the operation takes place, weather factors, presence or absence of night navigational aids, and the availability of radar equipment. In the absence of definite information, however, it must be assumed that operation is limited to daylight hours.

2. Longest Locking Cycle in Minutes (t)

If no other information is available, this may be taken as 45 minutes. Deviation from this figure may be occasioned by the design for filling, the size and lift of the lock, adequacy of guide walls, construction of equipment, availability of supplementary motive power, and efficiency of craft maneuvering.

3. Cargo-Handling Rate in Tons Per Linear Foot of Usable Berthing Space Per Day (h)

Inquiries of several U.S. commercial firms have revealed that the alongside loading and discharging rates for general (packaged) cargo vary between 1.5 and 10 short tons per linear foot of wharfage per-20 hour day. The variance is accounted for by: the degree of mechanization which, in addition to fixed lift facilities, includes such mobile equipment as conveyors, fork lift trucks, and mobile and floating cranes; adequacy of working space; the distance from the wharf to the transit shed, rail car, or storage area; and the efficiency of the stevedore gangs.

4. Percentage of Total Cargo-Carrying Capacity Available After Deadlining Loss (r_1)

Total craft tonnage available usually must be reduced to take into consideration craft which are out of service for repairs. Normally, it may be assumed that 85% of the total cargo craft inventory is available for use at any given time. The actual percentage of craft in service at a given time, however, will vary, depending upon how intensively the waterways are used, the precentage of dumb to self-propelled barges, the type of barge construction, availability and capability of repair facilities, the age of the fleet, and the seasonal time available for repairs.

5. Percentage of Tugs Available After Deadlining Loss (r_2)

Tugs and other powered craft usually require somewhat more maintenance than dumb craft. Normally, 80% of the total powered craft inventory is available for use at any given time.

6. Percentage of Rated Cargo Capacity Available Considering Type of Cargo Hauled (m)

The rated capacity of inland waterway cargo craft is usually given in cargo deadweight tonnage, or total weight tons of cargo a vessel can carry when loaded to maximum safe draft. Since the weight per unit of space occupied varies with different types of cargo (stowage factor), a vessel's cargo space is often fully occupied without fully utilizing the vessel's cargo weight carrying capacity. Experience has shown that military cargo utilizes only about 60% of a vessel's cargo weight carrying capacity. Bulk cargoes such as coal, ore, and POL normally can be loaded in sufficient volume to utilize a vessel's maximum weight carrying capacity.

7. Average Speed of Craft in Miles Per Hour in Open Waterway (S)

Average speed of craft varies widely, depending upon the type and age of craft, make-up of tow, traffic control, clear distance to be traversed, physical characteristics of waterway, and the degree of development of inland waterway transportation in a given area. The following table represents typical speeds in still water of craft in China, USSR, Germany, Iraq, and the United States.

Typical Speeds For Use When Specific Data is Not Available

Type	Speed (in still water) MPH	Remarks
China		
Sailboats	2.0	
Junks (towed)	6.1	
Junks (motorized)	9.2	60-ton cargo capacity.
Packet boats	7.0-10.0	300 to 970 passengers plus 36 to 350 tons of cargo.
Larger scheduled packet boats	5.5-6.5	On Yangtze River only.
Passenger vessels	5.5-10.0	60 to 720 passengers.

Type	Speed (in still water) MPH	Remarks
USSR		
Self-propelled barges		
2,000 tons (deadweight)	10.5	
1,000 " "	10.0-11.5	
600 " "	8.5	
500 " "	9.5	
200 " "	8.75	
Barge tows	2.5-3.0	Upstream on Volga River only.
Germany (locked waterways)		
Self-propelled barges	5	Ruhr to Berlin.
Barge tows	2.5	Ruhr to Berlin.
Self-propelled barges	5	Hamburgh to Berlin.
Barge tows	2.7	Hamburgh to Berlin.
Iraq (open water)		
Single self-propelled Commercial vessels	4.8	Basra to Baghdad at Highwater.
Single self-propelled Commercial vessels	4.0	Basra to Baghdad at Lowwater.
United States		
Larger scheduled barge tows	3.5-6.0	On Mississippi River System.
Scheduled barge tows	4.0-8.0	On Columbia and San Joaquin River.
Packet boats	8.0-11.0	On Columbia and San Joaquin River.

8. <u>Length of Working Day in Port in Hours</u>. (y)

This may be taken as 20 hours, but actually reflects around-the-clock utilization of port facilities for loading, unloading, clearing cargo from wharves, changing shifts, and other delays inherent in port operations.

9. <u>Rate of Handling Cargo in Tons Per Hour</u>. (f)

This rate is determined by multiplying the cargo-handling rate in tons per linear foot of berthing space per day (h) by the overall length of the vessel, divided by the number of working hours in port each day.

APPENDIX "B"

METHODS OF DETERMINING TONNAGE THAT CAN PASS THE MOST LIMITING LOCK (a)

1. COMPUTATION OF VESSEL CAPACITY FROM ITS DIMENSIONS

Since vessels are constructed in an infinite variety of sizes and shapes, a formula for computing the capacity from dimensions would be intricate and involved. Fortunately most cargo-carrying craft used on the inland waterways are designed for maximum utilization of space rather than for speed or beauty. Almost without exception, cargo-carrying craft are rectilinear with only slight deviation from this form at the extremities. These square lines economize both on lock space and stowage space. Obviously if all corners of the barges were right angles, there would be a direct ratio between the product of the dimensions and the cargo-carrying capacity. Since the lines of the barges approach this optimum, employment of this ratio is suitable for estimating purposes. The most complete craft census or craft description obtainable emanated from Germany. A listing of these German craft types was made with dimensions and capacities. From these dimensions the theoretical

cubical displacement (based on square lines) was computed. Then, the ratio of rated capacity to this theoretical displacement was computed and the results averaged, both for self-propelled and dumb craft. These averages were 0.0204 for self-propelled barges and 0.0207 for dumb barges as shown in the following tables:

SELF-PROPELLED BARGES

Type	Length feet	Beam feet	Draft feet	Capacity tons	Displacement (cu. ft.)	Compt fact
Gustav Konigs	220	27	8	1,000	47,519	.0210
Kanalschiff	262	29½	6½	1,000	50,238	.0199
Rheinschiff	262	33½	7½	1,200	65,827	.0182
Rhein-Herne-Kanal-Kahn	262	31	8	1,350	64,976	.0208
Rheinschiff	269	34	8	1,500	73,168	.0205
Fluss und Kanalschiff	262	34½	5	1,000	45,195	.0221
					Average	.0204

DUMB BARGES

Type	Length (ft.)	Beam (ft.)	Draft (ft.)	Capacity (tons)	Displacement (cu. ft.)	Computed factor
Tjalk	82	16½	6	140	8,118	.0172
Harener Punte	85	18½	5½	180	8,648	.0208
Lahnschiff	111	17	6	220	11,323	.0194
Finowmass	131	15	5	200	9,825	.0204
Grossfinowmass	136	16½	5	250	11,220	.0223
Berlinermass	151	21½	5½	360	17,856	.0202
Masspitz	152	16½	7	360	17,556	.0205
Peniche	126	16½	7½	360	15,592	.0231
Neckarchiff	147	23	5½	360	18,596	.0194
Saalemass	167	19½	5½	400	17,910	.0223
Mainschiff	164	24½	5½	420	22,099	.0190
Grossaalemass	170	20½	5½	450	19,167	.0235
Breslauermass	180	26	5½	550	25,736	.0214
Kempenaar	164	21½	8	620	28,208	.0220
Weser-Kahn	198	28½	6	650	33,858	.0192
Plauermass	213	26	5½	650	30,458	.0213
Dortmund-Ems-Kanal -Kahn	220	27	6½	750	38,609	.0194
					Average	.0207

In consideration of the many variabilities encountered, 0.02 appears to be sufficiently accurate. Therefore, the conclusion is that:

> Where maximum tonnage of craft is unknown and only the dimensions of the maximum size craft which can pass through the limiting lock are known then:
>
> $a_1 = 0.02\ lwd$ (when dimensions are in feet)
>
> $a_1 = 0.7\ lwd$ (when dimensions are in meters).
>
> Where:
>
> a_1 = approximate capacity of craft in tons when rated capacity is unknown
>
> l = length of craft
>
> w = width of craft
>
> d = loaded draft

2. COMPUTATION OF LOCK CAPACITY FROM ITS DIMENSIONS

A factor based on the relationship of lock size to vessel size when the lock dimensions are known must reflect the customary clearances at the ends, sides, and bottom of the lock. In some cases these clearances are surprisingly little, only a few inches being allowed. Germany is one of the few countries in the world where there are both a variety of lock sizes and tailoring of craft to fit the locks. There are 5 known instances where the craft fit the locks closely. In some cases the horizontal dimensions nearly coincide, but there is a great difference between draft and depth over sill. Since inclusion of such instances would not give a true picture of the ratio of lock size to maximum craft dimensions, they are excluded. The result, as depicted by the following table, indicates that with craft adapted specifically to the locks, a utilization of 85 percent of the volume of the lock is realizable.

RELATIONSHIP OF CRAFT SIZE TO LOCK SIZE

CRAFT

Type	Length (feet)	Beam (feet)	Draft (feet)	Capacity (cu. ft.)
Finowmass	131	15	5	9,800
Grossfinowmass	136	16.5	5	11,200
Saalemasse	167	19.5	5.5	17,900
Rhein-Herne-Kanal-Kahn	262	31	7.5	61,000*
Peniche	124.5	16.5	6	12,300
			TOTAL	112,200
				61,000*
			GRAND TOTAL	173,200

LOCKS

Waterway	Length (feet)	Width (feet)	Depth (feet)	Capacity (cu. ft.)
Finow Kanal	139	17	5.2	12,300
Finow Kanal	139	17	5.2	12,300
Saale	174	20	6	20,900
Rhein-Herne-Kanal	541	32.8	8	142,000
Connecting French Waterway	126	17	6.5	13,900
		TOTAL		201,400

Relationship of craft size to lock size 173,200 = 85.9%

* Accommodates 2 barges

Multiplying the factors of 0.02 or 0.7, as applied to craft dimensions above, by 85 percent provides similar factors to be applied to lock dimensions which reflect necessary clearance reductions. Therefore, the conclusion is that:

> Where the dimensions of the limiting lock are known, but neither the maximum tonnage nor the dimensions of the largest craft which can pass through the lock are known then:
>
> a = .017 lwd (where dimensions are in feet)
>
> a = 0.6 lwd (where dimensions are in meters)
>
> Where:
>
> a = tonnage which can pass the most limiting lock per passage, considering the fit of the vessels available.
>
> l = length of lock chamber
>
> w = width of lock chamber
>
> d = depth over sill

APPENDIX "C" GLOSSARY

(As applicable to study on "Methodology for Computing Capability of Inland Waterways" dated 5 November 1956)

Barge	A floating craft of full body and heavy construction, designed for carrying cargo. Cranes or other cargo handling gear are often mounted on barges. (The distinction between a barge and a lighter is more in the manner of use than in form and equipment, the term barge being more often used when the load is carried to its destination, or a long distance, while the term lighter refers to a short haul, generally in connection with loading or unloading operations of deeper-draft vessels).
Barge Tow	A group of one or more barges and a powered craft such as a tug, towboat, pushboat or self-propelled barge.
Berthing Space	The water area fronting a wharf or mooring at which inland waterway craft may load or discharge cargo. Wharfage is usually expressed in terms of linear feet.

Capacity — The theoretical maximum amount of cargo, expressed in tons per day, that may be handled on a continuing basis by a given waterway facility with all contributing factors, such as barges, tugs, terminal facilities, personnel, and weather introduced into the system to an optimum degree.

Capability — The practical maximum amount of cargo, expressed in tons per day, that may be handled on a continuing basis by a given waterway facility when the limitations of the major contributing factors are considered to a practical degree.

Cargo — The load, freight or burden carried by inland waterway craft exclusive of its fuel, passengers and stores.

Conveyor — A more or less self-contained device for continuously transporting material in a horizontal or slightly inclined direction. If the inclination is steep and the material is carried upward, the device is usually called an elevator. The operating

force may be gravity or some form of mechanical power, such as electrical, hydraulic, pneumatic or steam. The material to be transported may be in bulk but divided temporarily into small portions for the purpose of conveying each portion carried in a separate container, or in permanent individual units or packets of uniform size and weight.

Craft Capability — The amount of cargo expressed in tons per day that may be moved by a given number of inland waterway craft on a continuing basis, exclusive of any restrictions imposed by the terminal facilities.

Craft Census — A detailed descriptive inventory of inland waterway craft.

Cycle — A round trip by inland waterway craft from origin to destination and return to point of origin.

Deadlining Loss — Amount of inoperable inland waterway craft, usually expressed in percentage of total cargo carrying tonnage for cargo carrying craft, and in number of

units for towing craft.

Deadweight Tonnage — The difference, in tons of 2,000 lbs., between the displacement of a dumb barge when light and when fully loaded. In the case of a self-propelled barge, the deadweight carrying capacity is the weight in short tons of cargo, fuel, water, stores, crew and their effects, that can be carried safely by that type of craft, exclusive of any draft limitation imposed by a waterway depth restriction.

Dumb Craft — Inland waterway craft which have no self-contained means of propulsion.

Fleet Capability — The amount of cargo, expressed in tons per day, that may be moved by a given fleet (including towing craft) on a continuing basis, exclusive of any restriction imposed by the terminal facilities.

Floating Crane — A crane mounted on a barge or ponton. Almost any type of crane can be used; thus the variety and size of floating cranes are especially great.

Floating cranes may be either self-propelled or non-self-propelled, and the float may range from a simple wooden barge to an elaborate molded-steel hull with built-in balancing tanks and pumps.

Fork Lift Truck — A self-propelled vehicle having two or more prongs or tines which may be elevated and used for handling packaged, crated or baled cargo.

Guide Wall — A wall at the entrance to a lock used for aligning inland waterway craft in approaching a lock. It may be constructed of concrete, timber or a series of dolphins.

Inland Waterway — A river, canal, lake, or other body of water, situated in the interior part of a country or region, used as a route or way of travel or transport. In the broad sense of the term, coastal routes utilizing protected bays, inlets, sounds, and connecting channels, such as the Atlantic and Gulf Sections of the Intracoastal Waterway in the U.S., may be

considered inland waterways.

Length of Haul	The distance between the origin and destination in which cargo is moved on an inland waterway (one way only)
Lock	A structure in an inland waterway or dock, generally with gates at each end permitting craft to pass from one water level to another.
Locking Cycle	The time required for the passage of craft through a lock and the return of craft in the opposite direction, returning the lock to its original state.
Mechanical Handling Equipment	Any apparatus or device used to move cargo from point to point at a terminal by means of applied power or gravity.
Mobile Crane	A self-propelled machine for hoisting cargo or heavy weights.
Navigational Aid	A marker on an inland waterway, such as a buoy, daymarker, light, etc., which assists in designating navigable channel of a stream.

Open Waterway	A natural stream or artificial canal in which there are no man-made obstructions such as locks and dams or shiplifts.
Radar	An electronic device sometimes used on inland waterway craft when visibility is poor to determine the presence and location of above-water obstructions to navigation.
Safe Draft	The maximum vertical distance between the water surface and the lowest part of a vessel feasible on a given water course with reasonable assurance of not grounding while navigating.
Stevedore Gang	A group of workers who load or discharge cargo carrying craft.
Stowage Factor	Relationship between measurement of cargo and weight of cargo. This relationship is based upon 40 cu. ft. per ton. Volume measurement varies from 9 cu. ft. per ton for pig iron to 1,000 cu. ft. for unnested wicker baskets. This would result in

a corresponding stowage factor ranging from .225 to 25.0.

Terminal Capability — The amount of cargo, expressed in tons per day, that may be handled by a terminal on a continuing basis, exclusive of any restrictions imposed by the water route or fleet.

Terminal Facility — All arrangements, structures, or group of structures operated as a single unit, used to facilitate the handling of cargo and passengers at a point of interchange between water and land carriers.

Towing Capability — The amount of cargo, expressed in tons per day, that can be propelled by tug, towboat, pushboat or self-propelled barge, exclusive of any restrictions imposed by the terminal facilities or cargo carrying fleet.

Towing Craft — Inland waterway craft (such as powered tugs, towboats, pushboats or self-propelled barges, sailing vessels, and manually-propelled craft) used

to propel dumb craft.

Transit Shed — Wharf structure used for short-time storage of cargo in transit.

Turnaround Time — The time required for inland waterway craft to make a round trip between two points.

Waterway Facility — All arrangements, means, structures, or group, or series of structures used to facilitate the handling or passage of cargo and passengers at a waterway terminal or along the water route.

Waterway System — A group or series of interconnected rivers, canals, lakes, or other bodies of water, used as an integrated route or way of travel or transport.

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